

Goddard Space Flight Center Among First 10 Users of the National LambdaRail



Goddard Space Flight Center's connection to the National LambdaRail sent Earth science data sets in real time to a 15-screen tiled display at the SC2004 conference in Pittsburgh, PA. Above, Eric Sokolowsky (GST, Inc.) of the Scientific Visualization Studio interactively views model and observation data from NASA's Animated Earth project.

NASA's Goddard Space Flight Center (GSFC) is one of the first 10 sites to send scientific data over the National LambdaRail (NLR), a growing multi-wavelength optical network that is linking research sites across the United States at 10 billion bits (gigabits) per second. With four times more bandwidth and number of wavelengths than the current national research network, the NLR will allow high-performance computers and data facilities hundreds of miles apart to communicate as if they were in nearby buildings. A GSFC Internal Research and Development project is funding the initial connection of GSFC high-performance computers to the NLR.

"The involvement of NASA Goddard demonstrated the capabilities of NLR and showed just how researchers in 'big science' will need this kind of capacity to make new discoveries about aspects of our world and to help transfer this knowledge to practical uses by others in carrying out important tasks that improve our lives," said Tom West, president and CEO of the NLR.

GSFC's NLR link debuted at the SC2004 high-performance computing, networking, and storage conference, which attracted a record-breaking international audience of nearly 8,000 people to Pittsburgh, PA, November 6–12. In cooperation with the National Science Foundation (NSF)-funded OptIPuter Project, an interactive demonstration flowed multiple Earth science data sets in real time to a 15-screen tiled display in the NLR booth. Data included output from high-resolution NASA atmosphere, ocean, and land surface models and observations from satellites such as Aura, Polar, and the Tropical Rainfall Measuring Mission. Near-term plans call for using the NLR connection to develop new science initiatives and cyber-infrastructure capabilities between GSFC and the Scripps Institution of Oceanography (SIO); the University of California, San Diego (UCSD); and the University of Illinois at Chicago (UIC). Linking high-performance computing clusters, scientific visualization stations, and storage networks at these locations constitutes an important step in the build-up of the LambdaGrid envisioned by OptIPuter Principal Investigator (PI) Larry Smarr of UCSD and Co-PI Tom DeFanti and Project Manager Maxine Brown of UIC, with whom GSFC is closely partnering.

The LambdaGrid data flows and tiled display are enabling technology with particular significance for scientific advances. PC display "real estate" of roughly 1 million pixels limits nearly all end-user labs, while many of today's science data objects are often in the range of 1 to 100 gigabytes and thus require much higher resolution and multiple screens. Moreover, as multi-disciplinary science increases in complexity, so does the need for collaboration among distributed specialists interactively examining shared large and detailed data objects. From polls of GSFC's Earth science community, the highest-priority technology is tiled wall displays to simultaneously display registered multiple fields that are normally only available singularly on a scientist's desktop.

GSFC is NASA's first Center using the NLR and will be joined by other NASA Centers in 2005. As of late 2004, GSFC computers connected to the NLR are located in the NLR suite at the Level3 Communications' optical fiber "carrier hotel" facility in McLean, VA. Near the start of 2005, a multi-gigabit-per-second connection will be enabled across DRAGON, a Washington, DC-area multi-wavelength research network that is funded by NSF. This connection will link McLean and high-performance computers at GSFC's main site in Greenbelt, MD. The co-PIs on GSFC's NLR project are Pat Gary and Jeff Smith; the co-investigators are the Information Technology Pathfinder Working Group, chaired by Milt Halem. John Orcutt leads SIO's NLR efforts. NLR-connected resources at SIO, UCSD, and UIC are part of the OptIPuter Project. During SC2004, servers at McLean, UCSD, and UIC hosted GSFC's science data, which flowed on-demand over separate 10-gigabit-per-second lambdas to Pittsburgh.

For More Information:

GSFC Lambda Network
http://esdcd.gsfc.nasa.gov/IRAD_Lambda.html

National LambdaRail
<http://www.nlr.net>

OptIPuter
<http://www.optiputer.net>

DRAGON: Dynamic Resource Allocation via GMPLS Optical Network
<http://dragon.east.isi.edu>

Animated Earth
<http://aes.gsfc.nasa.gov>

SC2004 Conference
<http://www.sc-conference.org/sc2004>